From owner-qrp-l@netcom.com Fri Jan 20 07:11:15 1995
Message-Id: <sf1e8ca2.050@novell.com>
Date: Thu, 19 Jan 1995 16:00:38 -0700
From: Craig Teerlink <Craig_Teerlink@Novell.COM>
Subject: A&A gel cell charger

On Tue, 17 Jan 1995 roberloo@tekadm1.cse.tek.com asked
about gel cell chargers. Bob, VO1DRB/WA6ERB, responded that
A&A engineering has a nice smart charger kit.

It bought and built that kit about 5 years ago now, with significant
upgrades to handle 20 amps into the 150 AH battery I was using.
(The original kit is 0.5 amps intended for 3-5 AH batterys) I've
had it on that battery for about 5 years now. The battery powers
my HF station, VHF packet station (which runs 24 hr/day) and
my Kenwood TS-732 on net nights. I load test the battery about
once a year and it still tests good as new. I've had many others
state that their Astron supplies set to 13.8V tend to cook
batteries, and even the automotive "smart" chargers found at auto
supply stores tend to fry a battery if permanently hooked to it.
No such problems with this one. The secret is in the control
chip. It really understands lead/acid and gel cells including
constant current bulk charge, cell equalization overcharge, temp
compenstation, and cycled trickle. I highly recommend it.

73,

Craig
KF7OY
cteerlin@novell.com

From owner-qrp-l@netcom.com Fri Jan 20 17:57:27 1995
Date: Fri, 20 Jan 1995 13:54:32 -0800 (PST)
From: John Dundas <ab6dg@netcom.com>
Subject: Re: A&A gel cell charger
Message-Id: <Pine.3.89.9501201308.A29490-0100000@netcom10>

For general info: I just talked with A&A. The complete kit is now $60,
and can be obtained with either .5 or 1 amp rating, and at various
voltages, in addition to 12 v. Their # is 714-952-2114
(no financial interest here)

72/3 de John AB6DG

On Thu, 19 Jan 1995, Craig Teerlink wrote:

> On Tue, 17 Jan 1995 roberloo@tekadm1.cse.tek.com asked
> about gel cell chargers. Bob, VO1DRB/WA6ERB, responded that
> A&A engineering has a nice smart charger kit.
>
>
(snip)

From owner-qrp-l@netcom.com Fri Jan 20 21:18:07 1995
Date: Fri, 20 Jan 1995 10:46:38 -1000
Message-Id: <199501202046.KAA15735@mango.aloha.com>
From: beltrani@aloha.com (Paul Beltrani)
Subject: Re: A&A gel cell charger

>about gel cell chargers. Bob, VO1DRB/WA6ERB, responded that
>A&A engineering has a nice smart charger kit.
>
>It bought and built that kit about 5 years ago now, with significant
>upgrades to handle 20 amps into the 150 AH battery I was using.
> ...
>No such problems with this one. The secret is in the control
>chip. It really understands lead/acid and gel cells including
>constant current bulk charge, cell equalization overcharge, temp
>compenstation, and cycled trickle. I highly recommend it.

  Is the charge controller a custom A&A chip? If not I would like
to know the chip number, it sounds like it would make a nice
addition to the parts box.

   - Paul Beltrani
                  beltrani@aloha.com
                  n2kzz@nh6yw.hi.usa.oc Amateur Radio Packet

From owner-qrp-l@netcom.com Fri Jan 20 21:44:49 1995
From: LVE1@inel.gov
Message-Id: <9501201737.AA13332@garnet.inel.gov>
Date: Fri, 20 Jan 1995 10:38:18 -0700
Subject: Another UNZIP program

If you don't need to compress files and just want to uncompress *.zip files,
there is a "freebee" program available from oak.oakland.edu in the directory
/pub/msdos that seems to work OK with files created with PKZIP. The file
name is UNZIP.EXE -- download it using binary mode and type UNZIP to get
list of switches and options. It appears that it will automatically create
any directory structures included in the .zip file, but I haven't tested it.
There are also some other archiving programs and utilities in the
directories /pub/msdos/archiver and /prb/msdos/archutl directories you might

want to check out. And don't forget to look at all the good stuff in the
/pub/msdos/hamradio directory!

72 --

   ____
   "Any opinions expressed herein are my own and probably do
    not agree with those of my employer, the U.S. Government
                         or my spouse"
                         --...   ...--
                         Larry V. East
              Idaho National Engineering Laboratory
                        Idaho Falls, ID
                    e-mail: LVE1@inel.gov
                 Packet: W1HUE@WT7B.ID.USA.NOAM
          work: (208) 533-4005   home: (208) 529-2162

From owner-qrp-l@netcom.com Fri Jan 20 17:07:18 1995
From: PDouglas12@aol.com
Date: Fri, 20 Jan 1995 15:14:05 -0500
Message-Id: <950120151223_7988377@aol.com>
Subject: ARRL list

Would someone please post how to subscribe to the ARRL bulletins list? I saw
this once before, and stupidly didn't store the message. Thanks. Preston
WJ2V

From owner-qrp-l@netcom.com Fri Jan 20 09:33:21 1995
Subject: C.Turner/FOX
From: brian.carling@acenet.com (Brian Carling)
Message-Id: <2a6.7848.500@acenet.com>
Date: Fri, 20 Jan 1995 07:14:00 -0500

>From: brian.carling@acenet.com

turner@safety.ICS.UCI.EDU (WA3JPG) wrote:

CSTW>Well, I worked Rick right off the bat. Went looking on 40 shortly
CSTW>after 6 pm my time, and there he was "S5" and above for a lot of the
CSTW>time. Sounded really good, with sharp audio that cuts through the noise.
CSTW>Nice job, Rick.

CSTW>Tried to find you on 75, no luck. The band was crowded down here, and qui
CSTW>long. Hope you snagged a few down there.

Funny I didn't hear a thing out of the WB3 on CW last night
between 0000-0200 UTC on either 7110 or 7040 kHz.
Band conditions were abysmal though... 73 de AF4K

 ~ SLMR 2.1a ~ You ARE what you think about all day long!

From owner-qrp-l@netcom.com Sat Jan 21 00:56:03 1995
From: JDuffy@aol.com
Date: Fri, 20 Jan 1995 21:44:28 -0500
Message-Id: <950120214426_172390@aol.com>
Subject: Re: Cheaper Internet Access

Netcom can be reached at 408-983-5950. They can provide all the information
you need for cheaper Internet access and their highly rated GUI front-end.

Regards,

Duffy - WB8NUT

From owner-qrp-l@netcom.com Fri Jan 20 06:50:21 1995
From: FOXG@WCSUB.CTSTATEU.EDU
Date: Fri, 20 Jan 1995 0:40:31 -0500 (EST)
Message-Id: <950120004031.266068d4@WCSUB.CTSTATEU.EDU>
Subject: coming to Norcal

As host of "Inside Space" on cable's SciFi Channel I often get to do
location shooting... but not often in Norcal. Looks like I'll be in Palo
Alto/Menlo Park area Thursday evening thru Sunday morning. Is there anything
QRP'ish going on?
Speak quickly, I leave for Socal late Saturday.
72, Geoff WA1U

From owner-qrp-l@netcom.com Fri Jan 20 12:20:18 1995
Date: Fri, 20 Jan 1995 09:21:30 -0500 (EST)
From: prvalko <prvalko@vela.acs.oakland.edu>
Subject: Re: coming to Norcal
Message-Id: <Pine.3.89.9501200830.B6923-0100000@saturn.acs.oakland.edu>

On Fri, 20 Jan 1995 FOXG@WCSUB.CTSTATEU.EDU wrote:

> As host of "Inside Space" on cable's SciFi Channel I often get to do
> location shooting...

SciFi Channel?!?! Looks like TCI is screwing me out of yet ANOTHER cool
sounding channel! Does everyone else get about ten of those USELESS Home
Shopping Channels or is it just us in Michigan?

Thank goodness for QRP!

=paul= wb8zjl

From owner-qrp-l@netcom.com Fri Jan 20 23:40:18 1995
Date: Fri, 20 Jan 1995 15:18:52 -0800
From: Joe Gervais <jgervais@weber.ucsd.edu>
Message-Id: <199501202318.PAA09924@weber.ucsd.edu>
Subject: Re: coming to Norcal (SciFi Channel)

> > As host of "Inside Space" on cable's SciFi Channel I often get to do
> > location shooting...
>
> SciFi Channel?!?! Looks like TCI is screwing me out of yet ANOTHER cool
> sounding channel! Does everyone else get about ten of those USELESS Home
> Shopping Channels or is it just us in Michigan?

Useless? Why just the other day I was able to
purchase an Auto-Matic In-the-Cup Yogurt Stirrer
with Variable Speed Control(tm).

Think of the homebrewing potential!!! :)

(Sorry folks - had my hopes on operating foot-portable
this weekend but now it seems I'll be rained out... :|
Been a bit punchy as a result.)

7.3 de KD6PRD,

-Joe

Two-way QRP WAS: 2 down, 48 to go! (Ouch!)

From owner-qrp-l@netcom.com Fri Jan 20 23:37:20 1995
From: CQC@aol.com
Date: Fri, 20 Jan 1995 13:09:02 -0500
Message-Id: <950120130642_7856123@aol.com>
Subject: CQC Winter QSO Party Reminder

Just a reminder of the first Colorado QRP Club Winter QSO Party to be held
Feb. 19, 1995 from 1800 - 2359 UTC. Both CW and SSB may be used.

Exhange: RS(T), S/P/C, name (as in callbook or QSL), CQC # or power output.

Power must not exceed 5 watts output on either mode.

Classes: Single band; multi-band; Novice/Tech.

For complete rules, sample log and name sheets, send SASE to Jim, KG0PP Box 31575, Aurora, CO 80041-0575.

Further information: Jim KG0PP   EJim@aol.com

From owner-qrp-l@netcom.com Fri Jan 20 23:13:28 1995
From: GFriedla@griprod2.gri.org
Date: 20 Jan 95 16:38:00 EST
Subject: Hamcalc
Message-Id: <D02B202F01252C79@-SMF->

I am having trouble running Hamcalc9 on my pc. I keep getting "error 76 in line 420." I can run each individual program if I load them in basic separately.

I think the problem may relate to a required subdirectory organization. But those I've tried have failed.

Has someone been successful in getting this program to run correctly? Can you tell me your secret?   Thank you.

73, WD9HDM
Gary Friedlander (gfriedla@gri.org)

From owner-qrp-l@netcom.com Fri Jan 20 22:58:51 1995
Message-Id: <199501210029.SAA17477@ns1.arlut.utexas.edu>
Date: 20 Jan 1995 18:27:19 U
From: "rohre" <rohre@msmailgw1.arlut.utexas.edu>
Subject: Mysterious unsubscription

To all:

Beware, the unsubscribe another member suffered last week seems to have happened to me.

Does anyone know if there is an access limit number to the info commands from a particular email address per day? Maybe the server interprets that as a network problem, when there is a lot of those.

That is all I know was going on; that I used it to browse several other lists, then when I did a "which" to see why incoming qrp-l mail stopped this afternoon; it did not find me on any of the lists I have subscribed.

Because our mailer does not attach my genearic address (yet), I also have to

place that beside each subscribe <list>, and then get the "approvals required" message. Thus, I am waiting for the mails.

Sorry to bother all with this; but since it happened to another member, at least I suspected something early on this time.
Beware!
73/72
Stuart K5KVH
rohre@arlut.utexas.edu

From owner-qrp-l@netcom.com Fri Jan 20 06:06:50 1995
Date: Thu, 19 Jan 1995 12:13:35 -0800
Message-Id: <199501192013.MAA07839@ix3.ix.netcom.com>
From: mjsilva@ix.netcom.com (michael silva)
Subject: Need 2SC799 Specs

I've got a couple of 2SC799s but no specs for them. Are they a drop-in equivalent for the MRF-237, or a near relative (I've got the Motorola books)? If there's a lot of difference, can somebody tell me what they are? Thanks.

73,
Mike, KK6GM

From owner-qrp-l@netcom.com Fri Jan 20 20:16:19 1995
Message-Id: <199501201757.LAA10043@ns1.arlut.utexas.edu>
Date: 20 Jan 1995 11:55:42 U
From: "rohre" <rohre@msmailgw1.arlut.utexas.edu>
Subject: RE: Need 2SC799 Specs

Comparing them using the general replacements NTE Semi. cat. they are not drop in for each other, have different basing diagrams, and yours is higher voltage and gain than the MRF-237. The beta is listed at 50, while the 237 has a "min. 5" listing, for its equivalent. You might be able to change biasing, etc. to accomodate the substitution, but that depends how you are going to use it. It is a major difference on the surface. In the true ham tradition, someone could probably make it work; but why not take them to your next ham fest and trade for the real thing? Or if that is not practical for you, there are those trader nets on HF, usually they deal in equipment, but who knows, they might be interested; or someone here might trade you. The 2SC is a robust CB type final it looks like.

To: qrp-l@netcom.com
>From: michael silva on Fri, Jan 20, 1995 6:15
Subject: Need 2SC799 Specs
RFC Header:Received: by msmailgw1.arlut.utexas.edu with SMTP;20 Jan 1995

06:15:38 U
Received: from netcom11.netcom.com (root@netcom11.netcom.com [192.100.81.121])
by ns1.arlut.utexas.edu (8.6.9/8.6.9) with ESMTP id GAA04009 for
<rohre@arlut.utexas.edu>; Fri, 20 Jan 1995 06:15:06 -0600
Received: by netcom11.netcom.com (8.6.9/Netcom)
     id MAA04832; Thu, 19 Jan 1995 12:15:32 -0800
Received: from ix3.ix.netcom.com by netcom11.netcom.com (8.6.9/Netcom)
     id MAA04817; Thu, 19 Jan 1995 12:15:29 -0800
Received: from by ix3.ix.netcom.com (8.6.9/SMI-4.1/Netcom)
     id MAA07839; Thu, 19 Jan 1995 12:13:35 -0800
Date: Thu, 19 Jan 1995 12:13:35 -0800
Message-Id: <199501192013.MAA07839@ix3.ix.netcom.com>
>From: mjsilva@ix.netcom.com (michael silva)
Subject: Need 2SC799 Specs
To: qrp-l@netcom.com
Sender: owner-qrp-l@netcom.com
Precedence: list

I've got a couple of 2SC799s but no specs for them. Are they a drop-in
equivalent for the MRF-237, or a near relative (I've got the Motorola
books)? If there's a lot of difference, can somebody tell me what they
are? Thanks.

73,
Mike, KK6GM

From owner-qrp-l@netcom.com Fri Jan 20 06:50:22 1995
Date: Thu, 19 Jan 95 21:45:19 CST
From: msdooley@collie.aud.alcatel.com (Michael S. Dooley)
Message-Id: <9501200345.AA13276@collie.aud.alcatel.com>
Subject: Re: Novice Round-Up

Actually, Dana (and otheres), I was thinking more on the lines of the
49Mhz AM walkie talkie they (Tandy) build. It would be easy to change the
transmitter (crystal), but I need to look at the receiver and see if it's
worth the trouble.
Mike KE4PC

From owner-qrp-l@netcom.com Fri Jan 20 05:57:42 1995
Date: Thu, 19 Jan 95 22:35 GMT
From: oddjob@cix.compulink.co.uk (Stephen Walters)
Subject: Nuvistor QRP rig???
Message-Id: <memo.991206@cix.compulink.co.uk>

Dear all,

I have a acquired some RCA Nuvistors, would these be hand for a small qrp rig?????

regards

Steve

oddjob@cix.compulink.co.uk
Some data on nuvistors

Dear Steve, this data comes from a Sylvania tube manual:
heater: 6.3v +/- 10%, 130ma. Design max. heater-cathode voltage (total dc + peak ac): +/- 100v. Direct interelectrode capacitances (shielded):
Cg-p 0.92pf; input:Cg-(h+k+shell) 4.3pf;
output:Cp-(h+k+shell) 1.8pf; Ch-k 1.3pf; Cp-k 0.18pf.
h=heater,k=cathode,g=grid,p=plate.
Ratings--design max. values:
Plate supply voltage: 300v. max.
Plate voltage: 135v. max.
Plate dissipation: 1.0 W. max.
DC cathode current: 15ma. max.
Negative grid voltage: 55v. max.
Grid circuit resistance(self bias): 2.2Megohms max.
(fixed bias): 0.5Megohms max.

Characteristics and typ. operation--	Class A1 amplifier:	
Plate voltage:	70	110 v.
Grid resistor:	47k	--- ohms
Cathode resistor:	---	130 ohms
Plate current:	7.2	7 ma.
Transconductance:	12,000	9,800 micromhos
Amplification factor:	68	65
Plate resistance(approx.)	5,440	6,600 ohms
Ec (grid voltage) for Ib(plate current)=10microamps (approx.)	---	-4 v.

Application: The Sylvania type 6cw4 is a nuvistor high mu triode intended for use as a grounded cathode, neutralized R-F amplifier in VHF tuners. Type 6cw4 features a noise factor improvement of 2 to 4 db over current tuner tubes.

I hope this helps. I think the RCA manual also has plate curves, but I can't transcribe them here.
The basing is roughly: plate nearest narrower tab;

grid nearest wider tab; heater two pins near the center;
cathode remaining pin.
There have been construction projects using 6cw4's in ARRL
publications in the last 30 or so years, but that's pretty
broad. I recall a 420Mhz. superregenerative transciever in
one handbook and a grid dip meter, probably in another
edition, also some vhf or uhf receiver front end amps.
  73,
Jeff KD6MNP Jfurman@spa.mhs.compuserve.com

From owner-qrp-l@netcom.com Sat Jan 21 00:03:41 1995
From: NYOUNG@nova.wright.edu
Date: Fri, 20 Jan 1995 21:32:44 -0400 (EDT)
Subject: nuvistors
Message-Id: <01HM31A9JXDG8WWKGO@nova.wright.edu>

Man, nuvistors bring back some memories. And what about
those little flattened out hearing aid (as in remember the
box that went in grandpa's pocket where his cigarettes used
to go?) tubes that they used to have. I think I have a
couple of those laying around in the dust of the shack,
in the back corner where the cat takes all the milk jug
rings as if he'd caught a mouse. Now there was a tube.
No, the little flattened out things. Not the cat stuff.
  I remember once in the Navy we had to unrack some
crypto gear and there in the innards of all this high-tech
secrety stuff were tons of those little flattened out
hearing aid tubes. I have to chuckle thinking of it now.
I looked in there and thought "Who in their right mind would
put a bunch of those little dudes in there when you could
do the same thing with transistors?"
  It sure made sense then that they had the crypto spaces
air conditioned. What a nasty place to be with a hang-over.
(personal experience talking)
  Nuvistors and whatever those little flat dudes were
called. What a radio that would be. Great dynamic range
or something, eh?
73
Nils
WB8IJN &c

From owner-qrp-l@netcom.com Fri Jan 20 06:07:02 1995
Message-Id: <199501192223.RAA06124@jfwhome.funhouse.com>
Subject: Re: pcb: single and double sided
Date: Thu, 19 Jan 1995 17:23:54 -0500
From: "John F. Woods" <jfw@jfwhome.funhouse.com>

> What are the relative merits of single and double sided pcb for
> constuction? RF Design suggests that double sided is almost mandatory for
> medium power amp. stages, while elsewhere I've read (I believe) that one
> shouldn't use double sided for vfos. And (shame!) what are plated-through
> boards?

OK: for simple layouts (where you don't NEED both sides for wiring), double sided PCB allows you to use the top surface for a ground plane, giving you a good solid low-impedance ground for any point in the circuit which needs one. Amplifiers, especially medium power and up, are especially prone to requiring really good grounds. However, for a VFO, a double sided board means that you have a good solid low-impedance ground for every point in the circuit which *doesn't* need one: the stray capacitances of every component and every foil trace are magnified. What's worse, the circuit board material usually isn't chosen for ideal temperature coefficient (for its dielectric coefficient, that is), so the stray capacitances for the foil traces vary a *lot* with temperature. Component vibration also becomes a serious source of frequency instability (as opposed to being a merely annoying source :-).

So: you want double-sided boards almost anywhere *except* VFOs.

Plated-through holes: when you have a double sided board and want to electrically connect the top surface to the bottom surface, the professionals use electroplating to deposit a nice uniform layer of copper on the holes that are drilled through the board. Unfortunately, this requires some rather obnoxious chemistry, and isn't something a home designer should plan on doing (as your fellow U Toronto colleague, Henry Spencer, is fond of pointing out in sci.electronics from time to time). The alternative scheme is to use eyelets pushed through the holes and soldered top and bottom.

From owner-qrp-l@netcom.com Fri Jan 20 11:48:18 1995
Date: Fri, 20 Jan 1995 08:33:55 -0500 (EST)
From: prvalko <prvalko@vela.acs.oakland.edu>
Subject: Re: Power-Mite variations (Ten-Tec)
Message-Id: <Pine.3.89.9501200850.A6923-0100000@saturn.acs.oakland.edu>

For the record...

My PM-1 has 80, 40, and 15 meters on the dial. It does not have the 15M band module in it. PM-1s were also sold in "kit" form with pre-assembled modules. The one in the Ten*Tec museum does not have a top or side panels on the chassis.

My PM-2B is 80, 40, and 20 meters and it *is* white with black lettering.

My PM-3's are both beige with dark lettering.

73 =paul=

From owner-qrp-l@netcom.com Sat Jan 21 01:06:31 1995
From: Mike.Czuhajewski@hambbs.wb3ffv.ampr.org (Mike Czuhajewski)
Subject: Re: Power-Mite variations (Ten-Tec)
Date: Fri, 20 Jan 95 22:27:25 EST5EDT
Message-Id: <1995Jan20.222725.2323@wb3ffv.ampr.org>

And for what it's worth, TenTec also sold the 4 modules separately in the beginning--VFO, receive mixer, audio amp and TX (which has tremendous quantities of harmonics and was a prolific TVI generator at my home in rural Michigan at the time!). As a matter of fact, when I saw the QST ad for the 4 modules I thought it was so neat that I wrote to them, asking for a batch of brochures on them, and included them as an insert, free of charge, in an issue of QRP/8. (That was the newsletter that I was publishing at the time, circa 1969/70, which contained a QRP section--an extremely rare thing in those days--and which eventually morphed into the Milliwatt when Ade Weiss found out about it and came on board.) 73 and Queue Our Pea DE WA8MCQ
--
Mike Czuhajewski, user of the UniBoard System @ wb3ffv.ampr.org
E-Mail: Mike.Czuhajewski@hambbs.wb3ffv.ampr.org
The WB3FFV Amateur Radio BBS - Located in Baltimore, Maryland USA
Supporting the Amateur Radio Hobby, and TCP/IP InterNetworking

From owner-qrp-l@netcom.com Fri Jan 20 12:10:50 1995
Date: Fri, 20 Jan 1995 08:38:56 -0500 (EST)
From: CEBIK@utkvx.utk.edu
Subject: QRP tube rigs: some personal views
Message-Id: <01HM29T7YSB88YASYS@utkvx.utk.edu>

Jeff has opened a fascinating arena, with lots of nostalgia attached, when he started the topic of QRP with tubes. Did my KM/W with a 6U8 on 21 (tripler/amp, with a variety of external VFOs). 1 watt DC input in those days (actually 100 v @ 9 mA) to the pentode because it did not need neutralizing at 21 MHz. Blocked grid keying!

The last three words are my message--or opinion. Otherwise put: a quality signal, please. There have been discussions of signal quality here and on the homebrew newsgroup. Nostalgia builder, please apply the same principles to tube rigs. Keyed oscillators are nostalgic, but put out some terrible signals (chirps, clicks, the works) with cathode keying, plus eating the key contacts alive with high currents and voltages (full plate value to ground at the moment of contact, since the cathode floats until keyed--sort of a manual 2N706 switch). I remember turning out the lights in the shack and watching the little arc/spark as I keyed a 6AG7 (300 v) at the cathode--then my dad reminded me I would want to keep my old J-38

forever, so treat it kindly.

A nostalgic way of saying that if you build with tubes, please refresh yourself on the best principles of making tube rigs put out safe, economical, and quality signals. 1960s Handbooks have a lot of good principles, mos of which do not add any tubes. The Nuvistor idea is great: a low level oscillator (they work at 50 volts) and a grounded-grid "linear" might be a good idea. The dual section tubes make compact ways to separate stages, and there were some 3-section tubes (OSC/Buf-Mult/AMP?). And remember to use 1kV capacitors, even at lower tube voltages: they must all be derated from the printed Dcworking voltages listed.

Have a great time building.

-73-
LB, W4RNL
cebik@utkvx.utk.edu

From owner-qrp-l@netcom.com Fri Jan 20 05:52:26 1995
From: jeffrey@math.hawaii.edu
Date: Thu, 19 Jan 95 09:07:40 HST
Message-Id: <9501191907.AA03410@cruncher.math.hawaii.edu>
Subject: QRP With Tubes

I've gotten at least a dozen responses so for with regard to building a tube rig. Thank-you to everyone for your concern with my safety concerning not having the AC isolated from ground!

One person advised against running raw AC to the plate. That *surely* was not my intention; what a note that would produce (actually, probably a dozen notes! Sort of like the old MCW notes through a BFO rcvr on 500 kc).

I was thinking of using a full-wave bridge rectifier with associated filter caps and chokes to obtain a pure 160VDC with no ripple. But after reading the mail I now believe I had better include the transformer (probably two 12V ones back-to-back) so as to isolate the AC line.

Thanks for all those anecdotes! We should package them up and write a book. I especially liked the idea of waiting until one becomes an OT to build with tubes - at least we'll be able to see the parts!

I'd like to post some of the responses if none of the writers

have any objections.

73,
Jeff NH6IL

From owner-qrp-l@netcom.com Fri Jan 20 07:56:10 1995
From: rheiss@tuba.aix.calpoly.edu
Date: Fri, 20 Jan 1995 01:31:27 -0800
Message-Id: <9501200931.AA29688@tuba.aix.calpoly.edu>
Subject: Re: QRP with tubes

Yes, there is more interest in tube QRP. I've collected suitable tubes
such as 6AG7 and 35C5 in my junk box, a little isolation transformer
for safety with AC/DC gear, plus 1946 and 1948 ARRL Handbooks with
single-tube rig ideas. A `tri-tet' circuit could double or triple to
the high bands with a 40m crystal and one tube.

Robert Heiss KO6KA

From owner-qrp-l@netcom.com Fri Jan 20 23:01:28 1995
From: jeffrey@math.hawaii.edu
Date: Fri, 20 Jan 95 14:58:25 HST
Message-Id: <9501210058.AA03911@cruncher.math.hawaii.edu>
Subject: QRP With Tubes: Reprise   (Loooong)

It seems there's a subgroup within our group who have a strong interest
in building with tubes. This is wonderful! 1 or 2 tube QRP radios
surely can't be called `boatanchors', though; we'll have to call them
rowboat anchors or canoe anchors.

Here's a summary of what I've received so far; sorry for its length
but this will make up for all those ``I worked the fox!'' messages...

Jeff NH6IL

Oh gosh! I have to confess. There was an article in "Popular Electronics" I think bout 1958 to '60 on the sandwich box transmitter. A single 6AQ5 crystal oscillator for 80 or 40, Colpitts circuit if memory serves correctly. Keyed in the cathode with a hand key, (What's a keyer, then?) K5ONC K5JWK and a number of others and I built and debugged several of these among our high schools ham clubs in San Antonio. They were neat. Used a plastic box for chassis, like the ones that you carried your lunch to school in. I guess a number of mothers did not know why we all wanted to carry our lunch all of a sudden! I still have some 6AQ5's set aside to replicate one of these one day. Also, perhaps,

the Heising modulator I made with a 6AQ5 for a Heath DX 20 for AM as 9M2SM.
Hope to hear more of what you plan to do, and good fun, good luck!
73 and 72,
Stuart K5KVH

Jeff,
     My first transmitter was a single tube rig with raw-rectified AC line voltage (actually it was a voltage doubler to get 350 v) using a 50C5 tube. The filament was dropped from line voltage with a 25 watt 400 ohm resistor I think.
     Plate circuit was a pill-bottle-wound coil, with 3 turn link. It was a power oscillator. I still have it, but am afraid to plug it in. Those electrolytics could be real bombs if they're weak with age.
Glen Leinweber VE3DNL leinwebe@mcmail.mcmaster.ca

I tried building one about 3-4 years ago. Basic single tube 6L6 crystal oscillator transmitter .. running from fairly low voltage.. I got it to put out about 5-6 watts but I was not happy with the keying. Never really put it on the air.   Also, unfortunately, I seemed to have lost my old 15 meter novice crystals 7040, 7042, 7045... which are now perfect for 40 meter QRP.. but there weren't with the rest of my old crystals.... Only one I cold find was 7002..
I also have a matching single tube transmitter.... I one-tube regen that I built some 25 years ago. Works pretty good.
One of these days I should get the pair of them running -- together.. Guess I should really get the whole mess running from batteries and try it for next year's 1B Field Day :-)
BTW, when I was building the transmitter.. I really wanted to use some really big/old/antique tube.. Something that would really look impressive, even though it might only be running a few watts... but I couldn't find any sockets for the few I had. One of these days I really need to go to a hamfest and replenish some of my old parts...
Pete Rossi - WA3NNA

Hi Jeff,
If you want to use 115v that's ok, but NEVER build a AC/DC power supply.
ALWAYS use an isolation transformer. You can take 2 from old TV's and hook them up back to back and then make your supply.
In the simple supply I think you are talking about, one side of the AC line gets grounded. In a perfect world this would not be too bad if you always had the common side of the line to ground.

But what happens is that a plug gets reversed, then the
"hot" side is to ground and a BIG shock hazard. Or the
building gets wired wrong here and there and the common
side of the wall socket gets the hot wire.
Or like in one apartment we lived in in Carson City, you
can measure around 100 volts from the common to ground!
In the equipment, grounds wind up on the metal cases or
panels. Or knobs etc etc.
How do I know these things you ask??? Let me count the ways
I've been shocked.......
The worst was when I had a modulator (am) on my lap while
sitting on the bed. Was trying to figure out why it didn't
work. Had a pair of 807's with about 700vdc on the plate.
Not sure what I got into but I snapped straght and the
modulator hit the wall on the other side of the room and
broke the tubes. Oh, was I mad! Saved a long time to buy
those tubes. Then I had to rewire the fillaments to take
the 12v 1625's. Phoooey....
Gota run, 73's, Ron
.........KU7Y.....................Monte "Ron" Stark.....

Jeff,
I've been interested in building a tube rig for some time. I've even got
a 450 v. transformer that I bought for the job. There is a xtal rig named
the 6L6 special in back issues of 73 mag. More interestingly, Boat anchor
Bob has reworked some vintage QST articles for VFO designs. I believe
they are at oak.oakland.edu. Maybe netcom.
More details if you follow up, 72, VE3UWL
Bruce G. Robertson Dept. of Classics, U. of T.

I have built several and a good friend (W8WVM) has been active with
published articles on several of his vintage rigs built from NOS.
kb8aob
Richard Clemens, Associate Professor West Virginia Wesleyan College

I'm really not too nuts about using raw off the wall ac to
make B+ for tube jobbers. I figger there's transformers what
can do the job just as well.
By the way, one of the back issues of SPRAT has a really nice
5 or 6 tube circuit for a complete transceiver. Design came
from the former SovUni but the article has tube cross refs and
a list of coils for every band including 10 m (ayeee!)
Some day when I'm really old and crotchety I'm gonna build
the damn thing. At least I'll be able to see the parts without
taking off the glasses. And it'll keep the shack warm to boot.

Hm....
Good luck with your madness. Sometimes the magic works.
73
Nils
WB8IJN &c

Jeff,
I used to build tube rigs--1/2/3-tube types--even had one of the last non-nostalgia tube rigs published in CQ about 1980.
The old circuits are a mix of penniless novice and QRP. Please use a well-filtered power supply to ensure the quality of the note and to have a bit of a safety margin (isolating AC line from "chassis" or buss ground). If you browse hamfest/surplus/etc., you can find some 125 volt-50 to 100 mA transformers, and perhaps even a small filter choke to go with the 350-volt electrolytic caps. With choke, Edc=.9Erms; without (i.e., cap filter alone), Edc=1.4Erms (with small loads).
My favorite 1-watt tube was the 6U8: colpitts Xtal Osc and triode amp for 40. On 21 MHz, used the triode as a tripler from external VFO and the pentode as an amp (no neutralization needed, but lower power rating). Of course, that was long enough ago that 1 watt was DC input to final exclusive of filament heating power. Used a 100-volt PS.
Happy building.
-73-
LB, W4RNL

Jeff,
Bill Orr did a series on tube type rigs (some fairly simple) last year in CQ mag. If you need references or reprints let me know.
72/73,
Clay N4AOX

Jeff NH6IL wrote about building a tube QRP rig and asked if anyone had been doing this.

Over Christmas break, I put together a one-tuber from a circuit that I found in a '50's Novice and Technician Handbook. I subbed in a 6AQ5 for the 6DQ5(?) in the circuit. YES, I even built it on a piece of maple shelf board! 9" x 8". It was a keyed oscillator type circuit. Also I replaced the pill bottle tank circuit with a torroid. I did however use a power transformer to supply about 210 VDC to the plate. (You could use two filiment transformers back to back to provide isolation from the line AC just to be on the safe side.) I have only one crystal 7.012 mhz.

Results were great! 4 watts output (RMS) with no noticable chirp or warble in signal. If my tuner isn't adjusted very well, it can have a lil chirp,

but that's my fault for not taking time to look at the SWR meter!

QSO's as of 12/19/94

Stat.	My RST	His	Location
EA7DPU	559	569	Seville, Spain
WA2WUH	599	599+	NJ, near Phil
N4ND	579	599	Richmond, VA
K2LVQ	579	589	NYC
KR4ER	559	599	Birmingham, AL
AA1DG	579	599	Sagamore MA
KR0Y	599	599	Hurst, TX
K8SJ	579	599	Youngstown, OH
VE3JSS	599	599	Ottowa

The first QSO was with a EA7 nr Seville Spain,... that really spoiled me for the first QSO! I've had other great QSO's stateside, notably N4ND, great op, and have lost my share of QSO's to noise, QRO ops etc. But, hey, that's life in the QRP lane!

I'd be glad to share any details about the rig if anyone is interested.

Greg Weinfurtner NS8O AEE BSS

I am glad to share with the net. BTW, I failed to mention the output tank circuit. One mental picture I have is one with a pi-network, using B&W or Airdux coil stock cut to freq, and tuned with single section variable caps. But, I remember mine or another rig having a coil on a pill bottle or something with a link coil of hookup wire over the ground end of the parallel tuned circuit. Either would work, of course. One saves one tuning capacitor. It would be interesting if someone knows what the harmonic rejection is for each.

73, Stuart

One thing I forgot to mention though.. about the one-tube regen.. I didn't realize that these things were not very "neighborhood friendly" until many years later.. I remember one day I was tuning around 40 meters with it connected to my big antennas.. and I heard one of the neighborhood hams on.. Didn't think anything of it as I listened in on his QSO.. Then, later I was talking to him on the phone and he mentioned that there was this #$*&! "carrier" on 40 that kept following him around.. I said "I didn't hear any carrier" ?? Not too much later I suddenly realized that he was hearing my receiver.. Oops!! :-)

So, I don't use the 1 tube-regen in the ham bands too much anymore :-)

But it does an amazing job for being so simple..

All you need is way to key the thing and you have a complete 1 tube QRP transceiver :-)

Pete Rossi - WA3NNA

Dear Jeff,

I have acquired some Nuvistors, tiny VHF valves/tubes. As soon as I have enough data for them I will experiment.
For example, someone sent me the following:-

> Dear Steve, this data comes from a Sylvania tube manual:
> heater: 6.3v +/- 10%, 130ma. Design max. heater-cathode voltage (total dc + peak ac): +/- 100v. Direct interelectrode capacitances (shielded):
> Cg-p 0.92pf; input:Cg-(h+k+shell) 4.3pf;
> output:Cp-(h+k+shell) 1.8pf; Ch-k 1.3pf; Cp-k 0.18pf.
> h=heater,k=cathode,g=grid,p=plate.
> Ratings--design max. values:
> Plate supply voltage: 300v. max.
> Plate voltage: 135v. max.
> Plate dissipation: 1.0 W. max.
> DC cathode current: 15ma. max.
> Negative grid voltage: 55v. max.
> Grid circuit resistance(self bias): 2.2Megohms max.
> (fixed bias): 0.5Megohms max.
> Characteristics and typ. operation-- Class A1 amplifier:

Plate voltage:	70	110	v.
Grid resistor:	47k	---	ohms
Cathode resistor:	---	130	ohms
Plate current:	7.2	7	ma.
Transconductance:	12,000	9,800	micromhos
Amplification factor:	68	65	
Plate resistance(approx.)	5,440	6,600	ohms
Ec (grid voltage) for Ib(plate current)=10microamps (approx.)	---	-4	v.

> Application: The Sylvania type 6cw4 is a nuvistor high mu triode intended for use as a grounded cathode, neutralized R-F amplifier in VHF tuners. Type 6cw4 features a noise factor improvement of 2 to 4 db over current tuner tubes.
> I hope this helps. I think the RCA manual also has plate curves, but I can't transcribe them here.
> The basing is roughly: plate nearest narrower tab; grid nearest wider tab; heater two pins near the center; cathode remaining pin.
> There have been construction projects using 6cw4's in ARRL publications in the last 30 or so years, but that's pretty broad. I recall a 420Mhz. superregenerative transciever in one handbook and a grid dip meter, probably in another edition, also some vhf or uhf receiver front end amps.
> 73,
> Jeff KD6MNP Jfurman@spa.mhs.compuserve.com

regards
Steve

See the current issue of QRP Quarterly!
73,
Bruce

Hi Jeff,
Please write the book. And publish some diagrams.
I still have my old PSA (power unit) with big transformer (220 in,
2 * 260 V 200 mA, 6.3 V 3 A out) and double rectifier tube
(glowing blue in the dark) dusting away on a shelf.
Some where in my 20-year planning the building of tube apparatus is planned.
Tubes: they do not break down silently, just glow red when mistreated.
72, Dirk Sibie, PA3GNR
     The Netherlands

Yes, there is more interest in tube QRP. I've collected suitable tubes
such as 6AG7 and 35C5 in my junk box, a little isolation transformer
for safety with AC/DC gear, plus 1946 and 1948 ARRL Handbooks with
single-tube rig ideas. A `tri-tet' circuit could double or triple to
the high bands with a 40m crystal and one tube.
Robert Heiss KO6KA

Hello Jeff,
I've been thinking about tube QRP too! Let me share my current thoughts.
With my little QRP rigs, like my NorCal40, I have lots of fun with 1 or 2
watts out. This works great when I go camping and want to run efficiently
off of a battery. At home I almost exclusively use my NorCal there too,
but would like to run more power. So far I've modified the daylights out
of my little NorCal40, and can get 5 watts out, but now I consume much
more power than I'd like when on the road.
So here's a possible fun project/solution:
Design and build a one tube amp, which can be added to any QRP rig. It's
features would include T/R switching, and output power adjustment. With
one watt of RF input, it would provide 5 watts out. Of course with more
drive, it should provide higher wattage output. The amp should be capable
of 20 watts or so, but with the intent of using it in the 1 to 10 watt
range. If possible, power the thing from 48v DC (I don't know if that's
enough for tube circuits?) This would let folks pile up a set of truck
batteries on field day and use the amp! The project would also include a
48v DC supply in a separate case.
To expand on the idea, this could be kitted up and be a NorCal club
project. We could call it the NorCal Mt. Shasta QRP Amplifier! Or, pick a
good Mt. from your QTH in the islands! The case would be of some sort of
screened or perforated material, such that you could see the tube in there

glowing away, and feel all that good tube nostalgia! This kit would be fun for many QRP folks who would like to learn a little about tubes. It would work with any QRP rig.
Anyway, just an idea. Whatchyathink?
72 es 73,
Larry AB7GZ (NOT ASSOCIATED WITH THE PRODUCTION OF NORCAL RIGS - JUST A VERY HAPPY CUSTOMER)

I wish you would, because I'm interested in the same thing. Have you seen Dave Ingram-K4TWJ's "Golden Classics of Yesteryear"? Believe MFJ publishes or sells it, but it's often available in ham stores. It's got LOADS of info on tube rigs (tx and rx) from the 20's, 30's, 40's, including several QRP 1-tube rigs. Dave's writing style is a blast to read, and the book (softbound, 8.5x11 roughly) is chock full of practical info, such as building power supplies from two 25v back-to-back xfmrs.
GL es hope to hear from you again (forwarded posts and progress!) on the list
de KC4EWT
Johnson_Dan@aac.com

Jeff has opened a fascinating arena, with lots of nostalgia attached, when he started the topic of QRP with tubes. Did my KM/W with a 6U8 on 21 (tripler/amp, with a variety of external VFOs). 1 watt DC input in those days (actually 100 v @ 9 mA) to the pentode because it did not need neutralizing at 21 MHz. Blocked grid keying!
The last three words are my message--or opinion. Otherwise put: a quality signal, please. There have been discussions of signal quality here and on the homebrew newsgroup. Nostalgia builder, please apply the same principles to tube rigs. Keyed oscillators are nostalgic, but put out some terrible signals (chirps, clicks, the works) with cathode keying, plus eating the key contacts alive with high currents and voltages (full plate value to ground at the moment of contact, since the cathode floats until keyed--sort of a manual 2N706 switch). I remember turning out the lights in the shack and watching the little arc/spark as I keyed a 6AG7 (300 v) at the cathode--then my dad reminded me I would want to keep my old J-38 forever, so treat it kindly.
A nostalgic way of saying that if you build with tubes, please refresh yourself on the best principles of making tube rigs put out safe, economical, and quality signals. 1960s Handbooks have a lot of good principles, mos of which do not add any tubes. The Nuvistor idea is great: a low level oscillator (they work at 50 volts) and a grounded-grid "linear" might be a good idea. The dual section tubes make compact ways to separate stages, and there were some 3-section tubes (OSC/Buf-Mult/AMP?). And remember to use 1kV capacitors, even at lower tube voltages: they must all be derated from the printed Dcworking voltages listed.
Have a great time building.
-73-

LB, W4RNL
cebik@utkvx.utk.edu

From owner-qrp-l@netcom.com Fri Jan 20 06:07:22 1995
Date: Thu, 19 Jan 1995 21:51:03 +0001 (EST)
From: howie cahn <wb2cpu@world.std.com>
Subject: QRPers and Contests - Opinions Wanted!
Message-Id: <Pine.3.89.9501192121.A13863-0100000@world.std.com>

Hi all --
I'm writing an article about QRP and contesting. I'd like to get
some opinions about how you feel about contests. Not the QRP-only
events, like the ARCI and MI tests, but the major, general contests like
ARRL DX, CQ WW, and SS. Do you participate and enjoy them, or, stay away and
wish they'd go away? Are there any changes you'd like to see to
make them more QRP-friendly? If you operate in them, do you do it for the
score and competition? to test out equipment? to work new countries,
states, etc.? If you hate them -- why??

Any comments will be welcomed and appreciated. Please send them to me
directly to me and I'll summarize for the list if there seems to be interest.
Many thanks.

72/73... howie
wb2cpu@world.std.com

From owner-qrp-l@netcom.com Fri Jan 20 05:51:50 1995
Date: Thu, 19 Jan 1995 15:44:31 +0800
From: Raymond.Anderson@Eng.Sun.COM (Ray Anderson)
Message-Id: <9501192344.AA06214@radium.Eng.Sun.COM>
Subject: RF Hybrid Quadrature Network

There was a message posted to the list a LONG time ago about
a broadband RF Quadrature Hybrid that was written up in one
of the magazines that would be suitable for use on the R2/T2
rig.

As I remember it, the device was built from toroid cores and
bifilar wire and had an octave bandwidth with pretty good
quadrature response.

I've searched the qrp list archives on ftp.think.com
(which go back to about 4-93) to no avail. The message
was posted prior to then.

Does anyone remember the message and/or article and perhaps
have a pointer to either?

Thanks!

72 de WB6TPU
Ray

raymonda@radium.eng.sun.com

QRP Quarterly Tech. Editor

From owner-qrp-l@netcom.com Fri Jan 20 07:11:11 1995
Message-Id: <199501192328.RAA22207@ns1.arlut.utexas.edu>
Date: 19 Jan 1995 17:25:09 U
From: "rohre" <rohre@msmailgw1.arlut.utexas.edu>
Subject: SSB Fox not heard on 80M

To all:
Well, the last time period and band segment was all I could manage due to some other duties; and by that time all I heard in that segment was those county hunters or what ever net on the low end of it, and one rag chew (not QRP) further up. The segment seemed absolutely quiet other than that. Besides the vertical, I need to hang my 80M dipole so as to hear things from other angles. Maybe by the next Fox......
73/72 and good luck to the hunters,
Stuart K5KVH
rohre@arlut.utexas.edu

From owner-qrp-l@netcom.com Fri Jan 20 05:57:10 1995
From: ab4el@cybernetics.net (Stephen Modena)
Message-Id: <9501192132.AA10422@cybernetics.net>
Subject: Re: The Fox...abt antennas
Date: Thu, 19 Jan 1995 16:32:44 -0500 (EST)

Mike--

> Well, the only one I heard was AB4EL (Steve).
> ....What kind of antenna you runnin' out
> there in N.C. Steve?
> Mike KE4PC
>

My antennas? First, let me say that I live in a duplex and have to hang my antennas from a couple of pine trees right next to the apartment.

Second, I'm on the middle of a long sloping hill facing north in
an urban neighborhood.

Not ideal.

80 M & 40 M: a dual band dipole made with 300 ohm twin lead...one
conductor cut to 80 M and the other to 40 M, hung with the apex
at 50 feet, as an inverted V. Love those Carolina Pine Trees!

80 M: 66 ft #12 multi-stranded tinned, insulated wire, hung vertically
up a pine tree; with 6 radials of 32 feet of #22 stranded, insulated
under the pine straw.

40 M: full size vertical dipole (#14 insulated, multi-strans, tinned)
hung between two close spaced trees, with center pulled taunt by
the 300 ohm feeder over a high level branch of a closeby tree...upper
arm loops back about 6 feet.

My personal belief is that the antennas must be high quality wire and
insulated...I firmly believe that most urban, copper antennas
immediately form a copper-oxide-sulphate-nitrate semi-conducting
layer...and that's just where the RF currents flow...more people are
QRP than realize it. :^)

And, oh yes, I yell into the mike during QSOs.

--
73/Steve/AB4EL ab4el@Cybernetics.NET in Raleigh, NC 35.81245N, 78.65849W

From owner-qrp-l@netcom.com Sat Jan 21 01:09:06 1995
From: JEVERHART@cayman.vf.ge.com
Date: Fri, 20 Jan 1995 21:35:14 -0500 (EST)
Message-Id: <950120213514.22024d61@cayman.vf.ge.com>
Subject: RE: VFO Drift

Bruce, on Jan 16, you wrote:

> I've built some ugly constructed vfos for 7 and 10 Mhz, but neither had
> the sort of stability I'm told you can get. I use NP0 ceramics for the
> caps, but I generally get them from a dusty bin in the surplus store. Am
> I understanding correctly that not all NP0s are created equal? This could
> be my problem. I take it any 'name-brand' NP0s are the good ones. Oh no.
> Don't tell me your really DO get what you pay for.
> 72, VE3UWL
>
> Bruce G. Robertson Dept. of Classics, U. of T.

Don't despair getting a stable VFO. Unfortunately, when you construct them ugly style lots of things can conspire against you.

First of all, slight mechanical instabilities can magnify temperature drift tendencies. Ugly style construction is not by any stretch mechanically rigid. This means that small temperature changes can affect component to component spacing that will cause stray capaictance to vary with temperature and time and goodness knows what else. When you consider that 7 Hertz at 7 MHz is 1 part per million, it seems reasoanble that very slight mechanical changes can have large effects on frequency stability.

Secondly, the circuits are usually open to circulating air currents in the room. This makes vfo components react differently to changes in air temperature - ones with more mass change temperature more quickly than lighter ones, so they will change value at different rates. This usually makes temperature drift randomly.

Another possible source of drift results from soldering the components. They take a LOOOONG time to stabilize after soldering. I think Doug Demaw, W1CER, has recommended letting everything settle out for 15 minutes or more after soldering any components before measuring drift.

Yet another drift source was mentioned on qrp-l a few months ago. If you have a JFET VFO, you likely have a high speed switchin diode like a 1N914 from its base to ground. These diodes have transparent bodies, and can be light-sensitive!

Inductors can be causes for serious instability. Ceramic coil forms are probably the best for VFO use, but their size is often prohibitive. And, of course coils with powdered iron cores have temperature sensitivity due to the characteristics of the cores. No matter what kind of core or form you use, the windings must be mechanically stable. The very best ceramic coil forms have grooves in them to keep the turns in place. With other forms, Q-dope or Duco cement can help keep things rigid. Another tip has been recommended by Wes Hayward, W7ZOI. He recommends with toroids that you make sure the turns have relaxed into their final shape before captivating them with Q-dope. To do this, boil them briefly after winding. This heating and cooling action expands the copper then allows it to shrink into place on the core.

The idea of a draft-proof light-tight case helped stabilize a W7EL rig I built on 40 meters. Originally I built it with a metal mesh top to its case. This allowed both random air currents and room lighting to impinge on the VFO circuitry. I made several test runs with constant room temperature, measuring a drift on about 2 KHz per half-hour. I measured the frequency every minute and plotted the results. It was not unusual to see a jump of 100 Hz between

measurements, superimposed on the drift curve.

After reading about the light-sensitive diode business, I added a solid piece of double-sided pc board to the top of the VFO compartment. Drift was reduced to less than 1 KHz per half-hour with no abrupt changes in the minute-to minute measurements. Not spectacular, but much more stable.

Let us know how you make out!

72/73,

Joe E. N2CX

BTW, sorry it took so long to get back to you. I finally got the time to gather my thoughts toghether all at once and look back to my notes on the W7EL rig :-).